

REMARKS

Upon entry of this amendment, which amends claims 15-36 and adds claims 37-40, claims 15-40 remain pending. In the March 02, 2002 Office Action, the Abstract of the disclosure was objected to for allegedly not sufficiently describing the claimed apparatus. Claims 26-36 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for having terms lacking antecedent basis. Claims 15-20 and 26-36 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,584,647 to Uehara et al. (hereinafter referred to as "Uehara et al."). Claims 21-24 were rejected under 35 U.S.C. § 103(a), as being unpatentable over Uehara in view of an alleged obvious matter of design choice. Finally, claim 25 was rejected under 35 U.S.C. § 103(a), as being unpatentable over Uehara in view of U.S. Patent No. 4,819,326 to Stannek (hereinafter referred to as "Stannek"). Applicant respectfully requests reconsideration of the claims in view of the above amendments and the comments below.

Objection to the Abstract

On page 2 of the May 02, 2002 Office Action, the Abstract of the disclosure was objected to for not describing the apparatus claimed in claims 15-36. Specifically, the Abstract was objected to because, allegedly, "the abstract does not describe an apparatus used as a component of a die bonder pivoting in horizontal planes sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details." Applicant respectfully disagrees.

As discussed in 37 C.F.R. 1.72 and M.P.E.P 608.01(b), "[t]he purpose of the abstract is to enable the United States Patent and Trademark Office and the public generally to determine quickly from a cursory inspection the nature and gist of the technical disclosure". There is nothing in 37 C.F.R. 1.72 or M.P.E.P 608.01(b) that requires that all details of the invention be discussed in the Abstract.

In the current abstract, the apparatus, including all components and each of their relationships to other components are clearly described. Furthermore, an apparatus having levers with horizontal pivot planes (and planes “parallel to [a] major surface of the substrate”, as in new claim 40) is clearly described in the last sentence of the Abstract: “The pivot planes of the levers can be perpendicular or parallel to the planes of the chip carrier and/or the substrate upon which the chips are mounted.” Accordingly, Applicant respectfully believes that the existing Abstract clearly and adequately provides a reader with the nature and gist of the technical disclosure and that no modifications are needed. Applicant requests, therefore, that the objection to the existing Abstract be withdrawn.

Claim Rejections – 35 U.S.C. § 112, Second Paragraph

On page 2 of the Office Action, claims 26-36 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for having terms lacking antecedent basis. Specifically, these claims were rejected for not including antecedent basis for the term “said first and said second end position delimiter means”.

Amended claims 26-36 do not have antecedent basis issues. Accordingly, Applicant respectfully requests that the § 112 rejections of these claims be withdrawn.

Claim Rejections – 35 U.S.C. § 102(b)

On pages 2-3 of the Office Action, claims 15-20 and 26-36 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,584,647 to Uehara et al. No explanation as to how Uehara et al. anticipates these claims was provided in the Office Action. For the following reasons, Applicant respectfully disagrees with the rejections.

As recited in independent claim 15, the presently claimed invention is directed at an apparatus for placing semiconductor chips on a substrate. The claimed apparatus comprises a

“first pivoted lever seated at one end on a first shaft and at an opposing end on a second shaft...”, a “second pivoted lever seated at one end on said second shaft...”, a drive coupled to said first shaft for pivoting said first pivoted lever in alternating pivoting directions...”, a “drive mechanism for rotating said second pivoted lever in an opposite pivoting direction...”; and a “semiconductor chip gripper...”.

By contrast, Uehara et al. discloses an apparatus for handling and transferring objects such as semiconductor wafers (col. 1, lines 12-13). The Uehara et al. apparatus comprises a first collapsible arm unit having a hand for holding an object, a second collapsible arm unit having a hand for holding an object, a first drive shaft for selectively extending and contracting the first arm unit, a second drive shaft for selectively extending and contracting the second arm unit, a third drive shaft for turning the first and second arm units while keeping the first and second arm units in a relative positional relationship, the first, second, and third drive shafts being disposed coaxially with each other, and an actuator mechanism for angularly moving the first, second, and third drive shafts about their own axes independently of each other. Col. 1, lines 39-51.

Uehara et al. does not disclose at least the following elements and limitations of independent claim 15. Accordingly, Applicant respectfully believes that Uehara et al. does not anticipate claim 15 and the claims that depend from it.

First, claim 15 recites that “a first pivoted lever” is “seated at one end on a first shaft”, which is “*mounted equidistantly between a first location and a second location*”. (emphasis supplied). Claim 15 further recites that “a drive coupled to said first shaft” alternately pivots the first pivoted lever through “an angle of pivoting between a first end position *in which said first pivoted lever is directed toward said first location* and a second end position *in which said first*

pivoted lever is directed toward said second location". (emphasis supplied). Uehara et al. not only does not teach a first shaft mounted "equidistantly between a first location and a second location", it also fails to teach how "a drive coupled to said first shaft" effects the first pivoted lever so that it is "directed toward" the first and second locations. For at least these reasons, therefore, Uehara et al. does not anticipate claim 15 and its dependent claims.

Second, claim 15 recites that "a drive mechanism" is configured to "rotat[e] said second pivoted lever in an *opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever*". Uehara et al. does not teach this aspect of claim 15. The arm units of the Uehara et al. apparatus are all rotated around a single vertical axle. An error of rotation following such a mechanical construction would lead to placing a semiconductor chip in the wrong place. The reason for this is that the y-coordinate of the chip changes nearly linearly with the angle of rotation when approaching the location at which the chip is to be released. According to the presently claimed invention, however, an error of rotation does not result in a placement error, because the two levers rotate simultaneously and in opposite directions. In other words, if the first lever is rotated too much, say by 1° , then the second lever is also rotated too much, but in the opposite direction, e.g. by -0.7° . So the errors of rotation of the two levers compensate each other, at least partially.

For at least the foregoing reasons, Applicant respectfully believes that Uehara et al. does not anticipate independent claim 15. Accordingly, Applicant requests that the § 102 rejections be withdrawn.

Claim Rejections – 35 U.S.C. § 103(a)

On page 3 of the Office Action, claims 21-24 were rejected under 35 U.S.C. § 103(a), as being unpatentable over Uehara in view of an alleged obvious matter of design choice. Claim 25

was rejected under 35 U.S.C. § 103(a), as being unpatentable over Uehara et al. in view of U.S. Patent No. 4,819,326 to Stannek (hereinafter referred to as “Stannek”). Claims 21-24 and claim 25 all depend from independent claim 15, which for the reasons provided above is believed to be allowable over Uehara et al. Accordingly, claims 21-24 and claim 25 are also believed to be allowable as depending from an allowable base claim and the § 103(a) rejections applied to them cannot be properly maintained. Nevertheless, as explained below there are additional reasons why the § 103(a) rejections of these claims cannot be maintained.

Regarding the § 103(a) rejections of dependent claims 21-24, Applicant respectfully disagrees with that the gear ratio aspect in claims 21-24 was an obvious design choice. The 1:3 gear ratio claimed in claims 21-24 has the advantage of allowing the apparatus to save space by optimally configuring the wafer table in relation to the substrates. This is neither simply a mere design choice nor made obvious from the teachings of Uehara et al. For at least this additional reason, therefore, Applicant respectfully believes that the § 103(a) rejections of claims 21-24 cannot be properly maintained.

The reasons why claims 21-24 are believed to be allowable over the prior art also apply to the rejection of claim 25. The addition of the Stannek reference does nothing to change this.

For the foregoing reasons, Applicant respectfully believes that claims 21-24 are allowable over Uehara et al. and claim 25 is allowable over Uehara et al. in view of Stannek.

Accordingly, Applicant requests that the § 103(a) rejections be withdrawn.


CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 408-282-1857.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 15-36 have been amended as follows:

15. (Once Amended) An apparatus used as a component of a die bonder for placing a semiconductor chip on a substrate, comprising:

a first pivoted lever seated at one end on a first shaft and at an opposing end on a second shaft, said first shaft mounted equidistantly between a first location and a second location, ~~said first pivoted lever having a second shaft seated at another end;~~

a drive coupled to said first shaft for pivoting said first pivoted lever in alternating pivoting directions through an angle of pivoting between a first end position in which said first pivoted lever is directed toward said first location and a second end position in which said first pivoted lever is directed toward said second location;

a second pivoted lever seated at one end on said second shaft, a sum of lengths of said first and second pivoted levers equalling a distance from said first shaft to said first location or said second location, said first and second pivoted levers pivoting in horizontal planes;

a drive mechanism ~~coupled to said second pivoted lever~~ for rotating said second pivoted lever in an opposite pivoting direction and with a predetermined gear ratio with respect to said first pivoted lever, the drive mechanism coupling said first and second pivoted lever such that the second pivoted lever is in an extended position with respect to said first pivoted lever when the first pivoted lever is in said first end position or said second end position; and

a semiconductor chip gripper seated at an opposing end of said second pivoted lever.

16. (Once Amended) The apparatus according to claim 15 wherein the angle of pivoting of said first pivoted lever between said first and second end positions equals 120° .

17. (Once Amended) The apparatus according to claim 15 wherein said drive mechanism comprises:

a first ~~fixed-toothed~~ wheel coupled coaxially to said first shaft;

a second ~~toothed-wheel~~ ~~fixed-and~~ coupled coaxially to said second shaft; and

a ~~toothed~~-belt looped around and engaging said first and second ~~toothed~~-wheels.

18. (Once Amended) The apparatus according to claim 17 wherein said ~~toothed~~-belt is comprises an intermediate wheel.

19. (Once Amended) The apparatus according to claim 16 wherein said drive mechanism comprises:

a first ~~fixed-toothed~~ wheel coupled coaxially to said first shaft;

a second ~~toothed-wheel~~ ~~fixed-and~~ coupled coaxially to said second shaft; and

a ~~toothed~~-belt looped around and engaging said first and second ~~toothed~~-wheels.

20. (Once Amended) The apparatus according to claim 19 wherein said ~~toothed~~-belt is comprises an intermediate wheel.

21. (Once Amended) The apparatus according to claim 17 wherein a gear ratio of said first ~~fixed-toothed~~-wheel and said second ~~toothed~~-wheel equals three.

22. (Once Amended) The apparatus according to claim 18 wherein a gear ratio of said first ~~fixed-toothed~~-wheel and said second ~~toothed~~-wheel equals three.

23. (Once Amended) The apparatus according to claim 19 wherein a gear ratio of said first ~~fixed-toothed~~ wheel and said second ~~toothed~~ wheel equals three.

24. (Once Amended) The apparatus according to claim 20 wherein a gear ratio of said first ~~fixed-toothed~~ wheel and said second ~~toothed~~ wheel equals three.

25. (Once Amended) The apparatus according to claim 15 wherein said chip gripper is rigidly connected to said opposing end of said second pivoted lever.

26. (Once Amended) The apparatus according to claim 15, ~~wherein at said~~further comprising first and said-second-end position delimiters means for said second pivoted lever are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

27. (Once Amended) The apparatus according to claim 16, ~~wherein at said~~further comprising first and said-second-end position delimiters means for said second pivoted lever are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

28. (Once Amended) The apparatus according to claim 17, ~~wherein at said~~further comprising first and said-second-end position delimiters means for said second pivoted lever are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

29. (Once Amended) The apparatus according to claim 18, ~~wherein at said~~further comprising first and ~~said second end position~~ delimiters means for ~~said second pivoted lever~~ are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

30. (Once Amended) The apparatus according to claim 19, ~~wherein at said~~further comprising first and ~~said second end position~~ delimiters means for ~~said second pivoted lever~~ are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

31. (Once Amended) The apparatus according to claim 20, ~~wherein at said~~further comprising first and ~~said second end position~~ delimiters means for ~~said second pivoted lever~~ are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

32. (Once Amended) The apparatus according to claim 21, ~~wherein at said~~further comprising first and ~~said second end position~~ delimiters means for ~~said second pivoted lever~~ are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

33. (Once Amended) The apparatus according to claim 22, ~~wherein at said~~further comprising first and ~~said second end position~~ delimiters means for ~~said second pivoted lever~~ are

arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

34. (Once Amended) The apparatus according to claim 23, ~~wherein at said~~further comprising first and said second end position delimiters means for said second pivoted lever are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

35. (Once Amended) The apparatus according to claim 24, ~~wherein at said~~further comprising first and said second end position delimiters means for said second pivoted lever are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.

36. (Once Amended) The apparatus according to claim 25, ~~wherein at said~~further comprising first and said second end position delimiters means for said second pivoted lever are arranged laterally to a direction of movement of said chip gripper and operable to guide said chip gripper during times when said first pivoted lever is conforming or disconforming to said end positions.